CLAIMS

1. Method for producing a workpiece, and in particular a plate, of steel which is resistant to abrasion and whose chemical composition comprises, by weight:

$$0.1\% \leq C < 0.23\%$$

$$0\% \leq Si \leq 2\%$$

$$0\% \leq Al \leq 2\%$$

$$0.5\% \leq Si + Al \leq 2\%$$

$$0\% \leq Mn \leq 2.5\%$$

$$0\% \leq Ni \leq 5\%$$

$$0\% \leq Cr \leq 5\%$$

$$0\% \leq Mo \leq 1\%$$

$$0\% \leq W \leq 2\%$$

$$0.05\% \leq Mo + W/2 \leq 1\%$$

$$0\% \leq B \leq 0.02\%$$

$$0\% \leq Ti \leq 0.67\%$$

$$0\% \leq Zr \leq 1.34\%$$

$$0.05\% < Ti + Zr/2 \leq 0.67\%$$

$$0\% \leq S \leq 0.15\%$$

$$N < 0.03\%$$

- optionally from 0% to 1.5% of copper,
- optionally at least one element selected from Nb, Ta and V at contents such that $Nb/2 + Ta/4 + V \leq 0.5\%$,
- optionally at least one element selected from Se, Te, Ca, Bi and Pb at contents which are less than or equal to 0.1%,

the balance being iron and impurities resulting from the production operation, the chemical composition further complying with the following relationships:

$$C^* = C - Ti/4 - Zr/8 + 7xN/8 \geq 0.095\%$$

and:

$$Ti + Zr/2 - 7xN/2 \geq 0.05\%$$

and:

$$1.05xMn + 0.54xNi + 0.50xCr + 0.3x(Mo + W/2)^{1/2} + K > 1.8$$

with: K = 1 if B $\geq$ 0.0005% and K = 0 if B < 0.0005%,

according to which the plate is subjected to a thermal quenching processing operation which is carried out in the heat for forming in the hot state and, for example rolling heat, or after austenitization by means of reheating in a furnace, in order to carry out the quenching:

- the workpiece or plate is cooled at a mean cooling rate greater than 0.5°C/s between a temperature greater than AC_3 and a temperature of from approximately T = 800 - 270xC* - 90xMn - 37xNi - 70XCr - 83x(Mo + W/2) to T-50°C,
- the workpiece or plate is then cooled at a mean core cooling rate Vr < $1150xep^{-1.7}$ greater than 0.1°C/s between the temperature T and 100°C, ep being the thickness of the plate expressed in mm,
- the workpiece or plate is cooled as far as ambient temperature and optionally planishing is carried out.

2. Method according to claim 1, further characterized in that:

$$1.05xMn + 0.54xNi + 0.50xCr + 0.3x(Mo + W/2)^{1/2} + K > 2.$$

3. Method according to claim 1 or claim 2, further characterized in that:

$$C \leq 0.22\%$$

and:

$$C^* \geq 0.12\%.$$

4. Method according to any one of claims 1 to 3, further characterized in that:

$$Ti + Zr/2 \geq 0.10\%.$$

5. Method according to any one of claims 1 to 4, further characterized in that:

$$Si + Al \geq 0.7\%.$$

6. Method according to any one of claims 1 to 5, characterized in that tempering at a temperature which is less than or equal to 350°C is further carried out.

7. Method according to any one of claims 1 to 6, characterized in that, in order to add titanium to the steel, the liquid steel is placed in contact with a slag containing titanium and the titanium of the slag is caused to diffuse slowly in the liquid steel.

8. Workpiece, and in particular a plate, of steel which is resistant to abrasion and whose chemical composition comprises, by weight:

$$0.1\% \leq C < 0.23\%$$

$$0\% \leq Si \leq 2\%$$

$$0\% \leq Al \leq 2\%$$

$$0.5\% \leq Si + Al \leq 2\%$$

$$0\% \leq Mn \leq 2.5\%$$

$$0\% \leq Ni \leq 5\%$$

$$0\% \leq Cr \leq 5\%$$

$$0\% \leq Mo \leq 1\%$$

$$0\% \leq W \leq 2\%$$

$$0.05\% \leq Mo + W/2 \leq 1\%$$

$$0\% \leq B \leq 0.02\%$$

$$0\% \leq Ti \leq 0.67\%$$

$$0\% \leq Zr \leq 1.34\%$$

$$0.05\% < Ti + Zr/2 \leq 0.67\%$$

$$0\% \leq S \leq 0.15\%$$

$$N < 0.03\%$$

- optionally from 0% to 1.5% of copper,
- optionally at least one element selected from Nb, Ta and V at contents such that $Nb/2 + Ta/4 + V \leq 0.5\%$,
- optionally at least one element selected from Se, Te, Ca, Bi and Pb at contents which are less than or equal to 0.1%,

the balance being iron and impurities resulting from the production operation, the chemical composition further complying with the following relationships:

$$C - Ti/4 - Zr/8 + 7xN/8 \geq 0.095\%$$

and:

$$Ti + Zr/2 - 7xN/2 > 0.05\%$$

and

$$1.05xMn + 0.54xNi + 0.50xCr + 0.3x(Mo + W/2)^{1/2} + K > 1.8$$

with: $K = 1$ if $B \geq 0.0005\%$ and $K = 0$ if $B < 0.0005\%$,

the steel having a martensitic or martensitic/bainitic structure, the structure containing carbides and from 5% to 20% of retained austenite.

9. Workpiece according to claim 8, characterized in that:

$$1.05xMn + 0.54xNi + 0.50xCr + 0.3x(Mo + W/2)^{1/2} + K > 2.$$

10. Workpiece according to claim 8 or claim 9, characterized in that:

$$C \leq 0.22\%$$

and:

$$C - Ti/4 - Zr/8 + 7xN/8 \geq 0.12\%.$$

11. Workpiece according to any one of claims 8 to 10, characterized in that:

$$Ti + Zr/2 \geq 0.10\%.$$

12. Workpiece according to any one of claims 8 to 11, characterized in that:

$$Si + Al \geq 0.7\%.$$

13. Workpiece according to any one of claims 8 to 12, characterized in that the thickness of the plate is from 2mm to 150mm.